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54 Antistatic hairbrush filament.

57 Antistatic hairbrush bristle having a nylon or polyester core and a compatible polymeric sheath containing carbon.

ANTISTATIC HAIRBRUSH FILAMENTBACKGROUND OF THE INVENTION

A wide variety of synthetic materials has been proposed for use as a substitute for hog  
5 bristles in brush applications, such as toothbrushes and hairbrushes. Nylon and polyester monofilaments have been used in both of these end uses. However, a continued difficulty, particularly with hairbrushes, is the creation of static electric charges with the  
10 use of polymeric brush bristles, especially at relative humidities below about 50% that are typical of dry climates and the colder winter months in many areas. While several antistatic brushes have been suggested in the past, none has provided the balance  
15 of tensile properties and antistatic characteristics that is needed for outstanding brush bristle performance.

SUMMARY OF THE INVENTION

The instant invention provides an improved  
20 monofilament suitable for use as a hairbrush bristle which provides an outstanding combination of antistatic performance and the tensile properties needed for a hairbrush bristle.

Specifically, the instant invention provides  
25 an oriented sheath-core monofilament suitable for use as a hairbrush bristle having a diameter of at least about 0.25 mm and

(A) a core of polymer selected from the group consisting of nylon and polyester  
30 in which the polyester is at least about 60 weight percent polybutylene terephthalate and the balance of the polyester selected from polyethylene terephthalate and cyclohexane  
35 dimethanol terephthalate, and

(B) a sheath adhered to the core, comprising about 10-40 weight percent of the monofilament and prepared from polymers selected from the group consisting of  
5 nylon 11, nylon 12, nylon 610,  
nylon 612 and copolyetherester, the sheath polymer having a melting point no greater than that of the core, and the sheath containing about from 20 to  
10 30 weight percent carbon,  
the monofilament having a resistance of less than about 4 megohms per cm and a Tensile Coefficient as defined herein of about from 0.3 to 5.0.

Preferably, the carbon used in the monofilament has a particle size of less than about 20  
15 microns.

#### DETAILED DESCRIPTION OF THE INVENTION

A wide variety of nylons and polyesters can be used for the core of the present monofilaments.  
20 Nylons which can be used for the core include polyhexamethylene adipamide (nylon 66) polycaprolactam (nylon 6) polyundecanoamide (nylon 11), poly dodecanoamide (nylon 12), polyhexamethylenedecanoamide (nylon 610), and polyhexamethylene dodecanoamide  
25 (nylon 612). In addition, polyesters can be used for the core, provided that at least about 50 weight percent of the polyester is polybutylene terephthalate (4GT), and the balance of the polyester is selected from polyethylene terephthalate and  
30 cyclohexane dimethanol terephthalate.

The polymer used for the sheath component of the present monofilaments must be adhered to the core and should have a melting point no greater than that of the core. For satisfactory adhesion, the melt  
35 viscosity of the core and sheath polymers should be

substantially the same. Accordingly, the sheath polymer should be of the same polymeric type as that of the core polymer. For example, a nylon sheath on a polyester core will lack the required sheath-core  
5 adhesion. Nylon which can be used for the sheath material can be selected from the group consisting of nylon 11, nylon 12, nylon 610, and nylon 612. Polyesters which can be used for the sheath material include polyetheresters. In general, copolyetherester  
10 elastomers should be used for the sheath material having 40-70 weight percent short chain polyether ester units and 10-30 weight percent phthalate or isophthalate moieties, with the balance being terephthalate. Copolyetheresters which can be used in  
15 the present invention include those copolymers which, together with their preparation, are described in Shivers, U.S. Patent 3,023,192; Witsiepe, U.S. Patent 3,651,014; Witsiepe, U.S. Patent 3,766,146 and Hoh et al., U.S. Patent 3,932,326, the disclosures of all of  
20 which are hereby incorporated by reference. Such copolyetheresters are commercially available as Hytrel® polyester elastomer resins.

The carbon black incorporated into the sheath of the present monofilaments can be selected  
25 from most commercially available carbon blacks. Preferably, the carbon black has a particle size of less than 20 microns and a surface area greater than 30 square meters per gram. The surface area is determined by nitrogen absorption as described in  
30 ASTM-D-3037-81, hereby incorporated by reference. In addition, the carbon blacks typically exhibit a dibutylphthalate absorption value of more than 50 cubic centimeters per 100 grams. Specific carbon blacks which can be used include, for example,  
35 acetylene blacks, intermediate super abrasion furnace

blacks, conductive furnace blacks, conducting channel blacks and fine thermal blacks.

The sheath-core monofilaments for the present invention can be prepared by conventional coextrusion techniques, as described, for example, in Kilian U.S. Patent 2,936,482, hereby incorporated by reference. For uniform admixture of the polymer and carbon black components of the sheath, it is desirable to separately feed the polymer and carbon streams to the coextrusion apparatus. The polymer and carbon black typically exhibit different flow rates, and the separate feeds permit more precise control over the relative proportions. In the alternative, polymer for the sheath component can be introduced into the extruder first, and the carbon black added at a downstream point of the coextrusion apparatus after the sheath polymer is in a molten condition.

The sheath component comprises about 10-40 weight percent of the monofilament. Less than about 10% of the sheath component can result in disruption of the conductive path during spinning and orientation of the filament, while more than about 40% can result in a reduction in the strength and toughness of the final product.

Preferably, for uniformity of the sheath component of the present monofilaments, the sheath polymer and carbon black are compounded in a separate, preliminary step, independent of the final coextrusion apparatus. Blending can be accomplished in conventional blending equipment, for example, a Banbury blender, a Farrell continuous mixer or a twin screw mixer. Generally, the carbon black and the polymer are added at the same time. If added separately, the sheath polymer is introduced into the blending apparatus first, and the carbon black added

once the polymer is molten. With screw mixers, a good dispersion of the carbon black in the polymer can be obtained even when starting with a dry blend of the two components, if they are of roughly the same particle size. In addition to the above techniques for preblending the sheath polymer and carbon black, prepared blends of polymer and carbon can be used, such as HTR-4659 and Hytrel G-40CB, both commercially available from E. I. du Pont de Nemours and Company.

Carbon blacks which have been found to be particularly satisfactory in the present invention include Vulcan P, Vulcan 9 and Black Pearls, carbon blacks commercially available from Cabot Corporation and Ketjenblack EC commercially available from Noury Chemical Corporation, a division of Akzona Incorporated.

When commercial blends of carbon black and polymer are used for the sheath component of the present monofilaments, concentrated carbon black dispersions can be let down with additional quantities of the same or different polymer used in the carbon black dispersion.

The concentration of carbon black in the sheath components of the present monofilaments is about from 20 to 30 weight percent. Less than about 20 weight percent of the carbon black does not provide sufficient conductivity to the monofilament, while concentrations of carbon black in excess of about 30 weight percent would result in unsatisfactory Tensile properties. The indicated concentrations of carbon black will result in a monofilament having a resistance of less than about 4 megahms per cm.

The present monofilaments, after extrusion, are oriented by drawing about from 2.4 to 5.0 times their original length. The orientation is carried out by conventional techniques, typically by heating the filament above the glass transition temperature of the core polymer and stretching by passing through rolls of varying speeds. In general, orientation by heating in steam is preferred, since the resulting products generally exhibit a lower resistance with greater process yield.

The optimum draw ratio for any specific filament will, of course, vary. However, excessive orientation can increase the resistance to a level markedly greater than the specified 4 megaohms per cm. The resistance of the present filaments is measured with a Megger model 21158 hand-cranked insulation tester (James G. Biddle Co.) at 1000 volts D.C. The alligator clamps are placed 2.54 cm apart on the sample to be tested.

The coextruded monofilaments of the present invention exhibit a Tensile Coefficient of about from 0.3 to 5.0. The Tensile Coefficient is a dimensionless number reflecting the stretch characteristics of the filaments, their stiffness and toughness in relation to the diameter of the monofilament. Toughness is approximated by the product of break load and elongation, and stiffness is measured by the initial modulus. It is, of course, necessary that these properties be in the same units. The Tensile Coefficient is calculated as the product of break load and elongation divided by the product of the initial modulus and the cube of the filament diameter. The Tensile Coefficient is calculated by the following formulas applicable to the various English or metric measurements systems.

$$= 21.4 \sqrt{\text{density}} \times \frac{\text{Tenacity (grams/denier)} \times \text{Break Elongation (inches)}}{\text{Modulus (grams/denier)} \times \sqrt{\text{Denier}}}$$

5

$$= \frac{\text{Tensile Strength (megapascals)} \times \text{Break Elongation (mm)}}{\text{Modulus (megapascals)} \times \text{Diameter (mm)}}$$

10

$$= \frac{\text{Tensile Strength (lbs./in.}^2\text{)} \times \text{Break Elongation (inches)}}{\text{Modulus (lbs./in.}^2\text{)} \times \text{Diameter (inches)}}$$

Tensile  
Coefficient

15

$$= \frac{\text{Break Load (lbs.)} \times \text{Break Elongation (inches)} \times \frac{4}{\pi}}{\text{Modulus (lbs/inch}^2\text{)} \times \text{Diameter}^3 \text{ (inches)}}$$

The monofilaments of the present invention provide outstanding performance as hairbrush filaments. They exhibit the tensile properties necessary to provide the required balance of toughness, stiffness and bend recovery. In addition, without sacrifice of these tensile properties, the present monofilaments, through the use of a conductive sheath, provide an antistatic performance which permits use of the monofilaments as brush bristles without the static generation typical of hairbrushes. Moreover, this is accomplished without a conductive path through the handle of the brush as has been previously suggested in the art.

Coextruded monofilaments exhibiting a Tensile Coefficient outside of the specified range of about from 0.3 to 5.0 will be deficient in one or more of the above characteristics. For example, monofilaments having a Tensile Coefficient greater than about 5.0 will lack the stiffness required for



brush bristles, while those having a Tensile Coefficient less than about 0.3 will not be tough enough for use as brush bristles.

The present sheath-core monofilaments, having carbon in the sheath component, have significantly greater toughness when compared, for example, to a monofilament having carbon black distributed throughout the filament. The present monofilaments also provide improved toughness over sheath-core monofilaments having a conductive core, since a conductive filler in the core, in order to provide electrical conductivity through the insulating sheath, would need to be present in large quantities that would depreciate the tensile properties. Moreover, the present filaments, through incorporation of the conductive filler throughout the conductive sheath, retain their electrical performance over periods of extended use, without any substantial quantity of the electrically conductive carbon breaking away onto the surface being brushed.

In the following examples, sheath core monofilaments were prepared by two basic techniques. In the first, the polymer and carbon black for the sheath component were separately melt blended prior to feeding to the coextrusion apparatus. These preblended sheath materials are referred to as "compounded". In a second technique, the sheath resin and carbon black are not melt blended prior to using the coextrusion apparatus, but are added as powder blends, and this technique is so identified.

#### EXAMPLES 1-5

In Examples 1 to 5, polyester resin was used for both the sheath and the core of the coextruded monofilaments. In each case, the sheath resin and carbon were melt blended prior to introduction into

the coextrusion apparatus. In these Examples, polybutylene terephthalate was used for the core. The sheath polymers were copolyether esters prepared from dimethyl terephthalate, dimethylisophthalate, poly(tetramethylene oxide) glycol and excess 1,4-butanediol. The quantities of components, as combined with the copolyetherester, are as summarized in Table I. The balance of the copolyether esters consists of additives such as catalysts and anti-oxidants. In Example 5, the sheath was a 78/22 weight % blend of two polyether esters.

TABLE I

15	<u>Copoly- ether ester</u>	<u>Terephthaloyl Units</u>	<u>Isophthaloyl Units</u>
	A	27.4%	7.95%
	B	40.44	-
	C	26.67	7.74
20	D	51.03	-

	<u>Copoly- ether ester</u>	<u>Polytetramethylene ether glycol - Number Average Molecular Weight 1000</u>
25	A	44.72
	B	35.38
	C	-
	D	15.96

30	<u>Copoly- ether- ester</u>	<u>Ethyl oxide-capped polypropylene ether glycol (Number Average Molecular Weight 2160)</u>	<u>Oxytetra- methylenoxy</u>
	A	-	19.56
	B	-	23.8
35	C	42.72	21.39
	D	-	32.62

1        Batches of about 3000 grams were blended in an "OOC"  
 Banbury mixer. The polyester resin and carbon were dried,  
 weighed out separately, and stored in sealed containers until  
 use. Half of the resin was added to the Banbury mixer, fol-  
 5 lowed by the carbon black and finally the other half of the  
 resin. The batch was mixed at 100 rpm while heating with  
 steam to raise the temperature to the flux point. Then the  
 speed of the mixer was reduced to keep the temperature of  
 the resin and carbon below 204°C. Three minutes after reach-  
 10 ing the flux temperature, the blended carbon and resin was  
 removed from the mixer and cut while hot into a size suit-  
 able for granulating.

The carbon black used in these examples was either  
 Vulcan P or Vulcan 9 \*), both being electrically conductive  
 15 carbon blacks commercially available from Cabot Corporation.  
 The concentration of carbon black in the sheath polymer was  
 25% in all cases.

The sheath polymer, blended with carbon, was dried  
 overnight in a vacuum oven at 95 to 120°C prior to extrusion.  
 20 The blended polymer was then introduced into a 28 millimeter  
 twin screw extruder at a rate of 50-65 grams per minute at a  
 temperature of 240 to 250°C (about 30°C above the melting  
 point of the 4GT core polymer). The core polymer was intro-  
 duced into an 83 millimeter twin screw extruder at a rate  
 25 of 250-265 grams per minute after drying under nitrogen at  
 120-150°C for at least 16 hours.

The molten polymers from the two extruders were fed  
 through an 8-hole coextrusion die with 2.54 mm capillaries.  
 The coextruded monofilament was quenched in water.

30        The coextruded monofilaments were then oriented by  
 drawing in line, heating with steam.

\*) Vulcan P and Vulcan 9 are identified as Color Index Pigment Black 7.  
 These two materials can be further characterized by the following  
 properties:

35	Surface Area(m <sup>2</sup> /g)	Oil Absorption (CC/100g di- butyl phthalate)	Tint Strength (% of Industry reference Black No. 3)
Vulcan P	130	116	104
Vulcan 9	101	114	120

The polyester sheath/core materials were tested for tensile strength, break elongation, and modulus, and their diameters were measured. The Tensile Coefficient was calculated and is indicated in Table II, together with other properties of the resulting monofilaments.

TABLE II

10	Exam- ple	Sheath Composition	Carbon Type	Draw Ratio	Resistance	Caliper mm
					Megaohms /2.54cm	
	1	A	V9	3.5	0.2	0.465 ± 0.038
	2	A	V9	3.5	0.2-2.0	0.516 ± 0.018
	3	B	VP	3.7	0.8-2.2	0.508 ± 0.033
15	4	C	V9	3.6	0.6-1.0	0.516 ± 0.091
	5	A/D (78/22)	VP	3.7	0.2-0.3	0.549 ± 0.030

20	Exam- ple	Break Stress Newtons	Break Strain %	Break Elong. for 2.54 cm Length (mm)	MPa Tens. Str.	Modulus MPa	Oval. mm	Tensile Coef- ficient
	1	39	68	17.3	234	2380	0.053	3.7
	2	48	68	17.3	228	2130	0.051	3.6
25	3	40	47	11.9	193	2220	0.058	2.0
	4	48	55	14.0	234	2100	0.025	3.0
	5	54	74	18.8	228	2100	0.051	3.7

## EXAMPLES 6-10 AND COMPARATIVE EXAMPLE A

In Examples 6 to 10 and Comparative Example A, sheath core monofilaments were prepared from polyamides used for both sheath and core. The sheath polymers were blended with carbon either by dry blending procedures or by a melt blending operation prior to introduction into the coextrusion apparatus.

In the dry, or powder blend procedure, a blend of nylon and carbon powder is tumble blended and dried over night at 120°C in a vacuum oven. The nylon resin is cryogenically ground to pass 60 mesh and not pass 200 mesh. This powder was then blended with the indicated amount of carbon, tumbled, and dried overnight at 120°C in a vacuum oven with a nitrogen bleed. The powder blend was then fed to a 28 mm twin-screw extruder while the indicated core polymer, after drying overnight in a hopper at 150°C was being fed to an 83 mm twin-screw. Feed rate to the two screws was maintained at a 4/1 ratio with an overall rate of about 13.6 kg/hour. In all cases, the undrawn billets had a resistance of less than 20,000 ohms per cm. The eight filaments spun from a 2.54 mm capillary were water quenched and then drawn in atmospheric steam at 137 m per minute to get a filament of about 0.51 mm diameter. In general, resistance increased as the draw ratio increased. Carbons of very high effective volumes as determined by surface area and dibutylphthalate absorption (pore volume) lose their conductivity on drawing more so than the electrically conductive furnace blacks of lower effective volume.

In the melt blending procedure, nylon, cryogenically ground to pass a 60 mesh screen but be 90% retained by a 200 mesh screen is tumble blended with carbon black and dried in a vacuum oven. The powder blend is then fed to a 28 millimeter twin screw extruder operated at a speed of 100 rpm. The bushings included three kneading blocks to assure melting of the nylon and mixing of the carbon powder. After extrusion, the strands were cut into 3.2 mm lengths. The melt blended polymer and carbon black is designated as compounded.

The sheath polymer and carbon blends as well as the core polymer were supplied to extruders as in examples 1 to 5, and subsequently extruded through a coextrusion die and oriented by stretching. The 5 resulting monofilaments are tested and the results summarized in Table III.

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TABLE III

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Exam- ple	Compo- sition Sheath/ Core	Carbon		Addition Method	%	Draw Ratio
		Powder Type	% in Blend			
6	612/612	Vulcan P	26	Powder Blend	20	2.6
7	612/612	Vulcan P	26	Compound	20	2.6
8	612/66	Vulcan P	26	Compound	13	2.4
9	610/66	Vulcan P	26	Powder Blend	20	2.4
10	612/612	Vulcan P	25	Compound	20	3.0S
A	6/66	Vulcan P	25	Compound	20	3.0R

Exam- ple	Resist- ance Megaohms/ 2.54 cm	Caliper mm	Break Strain %	Break Elong. for 2.54 cm length (mm)	MPa Tens. Str.	Modu- lus MPa	Tensile	
							Oval mm	Coef- ficient
6	0.05-0.6	0.475	61	15.5	158			
7	1.5-7	0.417	29	7.4	131	2800	0.036	1.84
8	0.05-0.15	0.498	60	15.2	138	2520	0.117	0.92
9	0.05-1	0.518	97	24.6	179	2220	0.025	1.90
10	0.25	0.551	20	5.1	172	2400	0.051	3.54
A	500	0.381	14	3.6	303	2480	0.135	0.64
						3720	0.061	0.77

## I CLAIM:

1. An oriented sheath-core monofilament suitable for use as a hairbrush bristle having a diameter of at least about 0.25 mm and

- 5 (A) a core of polymer selected from the group consisting of nylon and polyester in which the polyester is at least about 60 weight percent polybutylene terephthalate and the balance of the  
10 polyester is selected from polyethylene terephthalate and cyclohexane dimethanol terephthalate, and  
(B) a sheath adhered to the core, comprising about 10-40 weight percent of the  
15 monofilament and prepared from polymers selected from the group consisting of nylon 11, nylon 12, nylon 610, nylon 612 and copolyetherester, the sheath polymer having a melting point  
20 no greater than that of the core, and the sheath containing about from 20 to 30 weight percent carbon.

the monofilament having a resistance of less than about 4 megaohms per cm and a Tensile Coefficient of  
25 about from 0.3 to 5.0.

2. A monofilament of Claim 1 wherein the carbon has a particle size of less than about 20 microns.

3. A monofilament of Claim 1 wherein the  
30 melt viscosity of the sheath and core polymers is substantially the same.

4. A monofilament of Claim 3 wherein the sheath and core polymers are polyester.

35



5. A monofilament of Claim 4 wherein the core polymer consists essentially of polybutylene terephthalate.

6. A monofilament of Claim 3 wherein the sheath and core polymers are polyamide.

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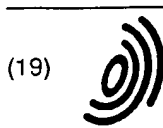
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## (54) TOOTHBRUSH

(57) The source of radiation of optical range (3) is built-in the cavity (2) of handpiece (1) of tooth brush comprising the transparent brush head (8). The combination of scattering properties of brush head (8), type of

radiation source (3) and brush transparency (7) allows to influence directly on different fields and tissues of oral cavity.

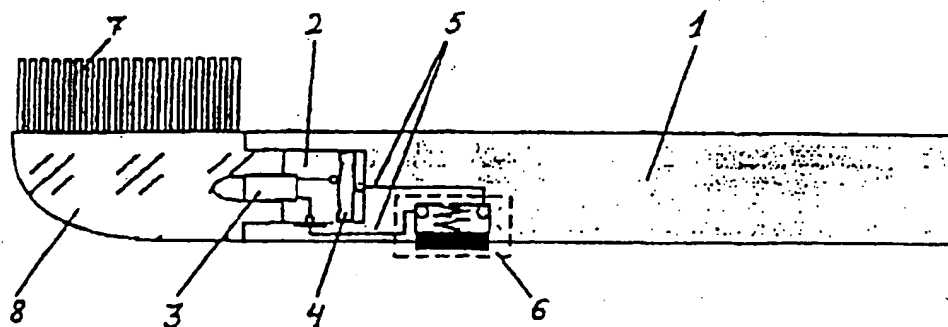


Fig. 1

EP 0 927 544 A2

## Description

### The field of engineering

[0001] The invention concerns to tooth brushes and can be used in dentistry for profilaxis and treatment of oral diseases.

### The previous level of engineering

[0002] It is known the tooth brush (PCT N90/0906, A61 N1/32, A46 B15/00 date of the publication 23.08.90) comprising the electrode on the handle and the electrode with sharpened edges in the base of bristle. The electronic circuit providing the conditions of application of bipolar pulse train (especially with 50 Hz frequency) to oral tissues and LED indicating the operation of electronic circuit are mounted inside the brush handle.

[0003] The main disadvantage of above device is that it is impossible to make the influence on teeth except the gum tissue.

[0004] It is known also the tooth brush which is the closest one from the technical point of view and can be accepted as a prototype (Japan N3-15883, A46 B15/00, A61 N5/06, D01 F8/04 date of the publication 04.03.91) comprising the handle with built-in power supply, heater and head with bristle made of special thermoactive material radiating in far infrared range.

[0005] The main disadvantage of the prototype is the absence of radiation providing the profilaxis and treatment influence on teeth and gum.

### The subject of the invention:

[0006] The problem solved by present invention consists of the creation of the tooth brush providing the profilaxis and treatment influence on tooth tissues and soft oral tissues.

[0007] The specified problem is solved under the realization of the invention due to achievement of technical result consisting of application of radiation of optical range that provides the antiinflammatory and caries protective influence on oral tissues as well stimulates their regeneration.

[0008] The specified technical result under realization of the invention is achieved due to the fact that in the tooth brush comprising the handpiece with cavity, brush head with bristle and built-in the handpiece cavity electrically connected through the switcher the radiation source and the power supply, the radiation source is represented by the source of radiation of optical range and brush head is made of transparent material and may be disconnected from the handpiece.

[0009] The said light source may be represented by laser diode or light emitting diode.

[0010] The said light source may be represented by a filament lamp and handpiece is made of color transpar-

ent material.

[0011] The said brush head may contain the light scattering materials.

[0012] The said brush head may have the reflecting or back scattering coating and bristle is made of transparent material.

[0013] The said brush head may contain the photoluminescent substances especially dyes.

[0014] It is well known the phisiotherapeutic influence of visible and near UV and IR radiations which at low doses make the biostimulating action on tissues. The most efficient is the laser radiation (AS.Kryuk., V.A.Mos-tovnikov, I.V.Khokhlov, N.S.Serdyuchenko. Therapeutic efficiency of low-intensity laser radiation. Minsk: Science & Engineering, 1986. V.E.Illarionov. The principles of laser therapy. M. Published by "RESPECT" of "INOTECH-Progress" Co.)

[0015] It is found out the antibacterial and antiinflammatory action of UV (330-380 nm), blue (440-450 nm) and green (514-590 nm) radiation. Besides that the red (630-640 nm) and near IR (830-1300 nm) radiation provides also the profilaxis and caries treating influence.

[0016] The profilaxis influence against caries is provided by irradiation of odontoblasts and tooth pulp due to waveguide effect of light propagation in the enamel prisms and dentinal tubules (see G.B.Altshuler, V.N.Grisimov. "The effect of waveguide light propagation in human tooth". Doklady AN USSR, v.310, N5, pp.1245-1248, 1990; G.B.Altshuler, V.N.Grisimov. "New optical effects in the human hard tooth tissues". Proc. SPIE. Lasers and Medicine, v.1353, pp97-102, 1991)

[0017] While the gums are irradiated both the antiparadontosis action and penetration of light inside teeth take place. The radiation is most efficient in the combination with massage of gums because the pressuring of alive soft tissue causes the increase of its transparency (see G.A.Askaryan "The increasing of transmission of laser and other radiation through the soft turbid physical and biological media". Kvantovaya Elektronika, v.9, N7, 1982, pp.1370-1383).

[0018] The useful irradiation of a whole oral cavity is provided in the claimed tooth brush due to the presence of light source connected to the electrical power supply and transparent brush head which can be made of light scattering material.

[0019] The types of light sources are determined by the necessity of application of light with specified spectral parameters and dose that are useful for specified type of hard and soft oral tissues.

[0020] More intensive irradiation of teeth and gums are provided with tooth brush that has the transparent bristle and reflecting or back scattering coating of a brush head.

[0021] The photoluminescent substances especially the dyes being introduced into the brush head provide practically all the useful spectral range of oral cavity radiation under the influence of a single shortwave, for example, UV or blue light source.

[0022] The author suppose that the set of claims is the new one as well the engineering satisfies the criterion of invention.

The brief description of figures:

[0023] The subject of the invention is specified by the figures, where

fig.1 represents the tooth brush which comprises the radiation source in the form of laser diode or light emitting diode connected to the power supply through the switcher and transparent brush head.

fig.2 represents the tooth brush which comprises the radiation source in the form of filament lamp and brush head made of color transparent material.

fig.3 shows the tooth brush which brush head has the reflecting coating and bristle is transparent.

The best version of the invention:

[0024] The tooth brush (fig.1) comprises the hand-piece 1 with cavity 2, the radiation source 3 built-in the handpiece cavity and electrically connected to the power supply 4 through the contacts 5 of switcher 6. The bristle 7 is fixed on the transparent brush head 8.

[0025] When the filament lamp is used as a radiation source 3 (fig.2) the brush head 8 is made of color transparent material.

[0026] The brush head 8 may be covered by reflecting coating 9 (fig.3) as well it may be made of light scattering material and covered by it. In this case the bristle 7 is transparent.

[0027] The device operates in a following way. After the power supply of radiation source 3 is switched on by pressing the button of switcher 6 the radiation from the source 3 reaches the body of brush head 8 and gets in the oral cavity.

[0028] If the filament lamp is used as a radiation source 3 the spectral filter cutting the desirable spectral range should be applied because of the wide spectral band of the source. The brush head made of the color (green, blue or red) transparent material may play the role of such filter.

[0029] If the bristle is made of the transparent material especially in that case when the brush head 8 is covered by reflecting coating 9 or when the radiation is scattered within the brush head the most part of radiation reaches the bristles, concentrates in them and then reaches the places of contact between bristle 7 and teeth or gum tissues.

[0030] Photoluminescent impurities, for example, dyes inside the brush head 8 provide the irradiation of oral cavity not only by radiation delivered from the radiation source 3 but also by radiations which spectral parameters are defined by Stokes law.

[0031] The wavelength of radiation emitted by the photoluminescent substances is always longer than the

wavelength of radiation source 3. If them is a single UV or blue radiation source it allows to deliver to the oral cavity the other desirable spectral components of visible and infrared light.

[0032] The example of claimed device is the following: laser diodes are SDL-2380-S with 810 nm radiation wavelength and SDL-7430 with 675 nm radiation wavelength (see Product Catalog SDL "Semiconductor Diode Lasers" 1995), light emitting diodes are LEDS-5 and LEDS-3 (blue, green, red) (see Catalog "RS components", Viena, 1995); the low-dimension power supply is VARTA chrom 547.

The industrial application:

[0033] Thus taking into account above the claimed device allows to solve the problem of profilaxis and treatment influence on oral tissues

## 20 Claims

### 1. A tooth brush comprising:

a handpiece with cavity;  
a removable brush head with bristle;  
a light source; and  
a power supply,  
wherein said light source and power supply are built-in handpiece and brush head is made of transparent material.

2. The invention as defined in claim 1 wherein said light source is a laser diode.

3. The invention as defined in claim 1 wherein said light source is a light emitting diode.

4. The invention as defined in claim 1 wherein said light source is a filament lamp and brush head is made of color transparent material.

5. The invention as defined in claim 1 wherein said brush head contains light scattering materials.

6. The invention a defined in claim 1 wherein said brush head has reflecting or back scattering coating and bristle is transparent.

7. The invention as defined in claim 1 wherein said brush head contains photoluminescent substances.

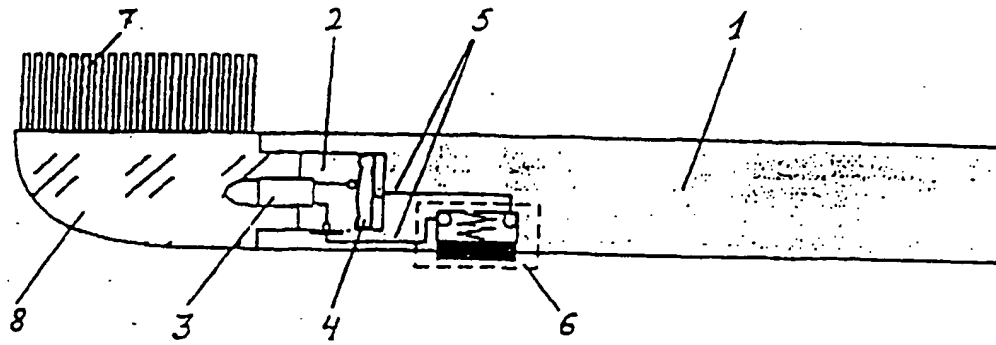


Fig .1

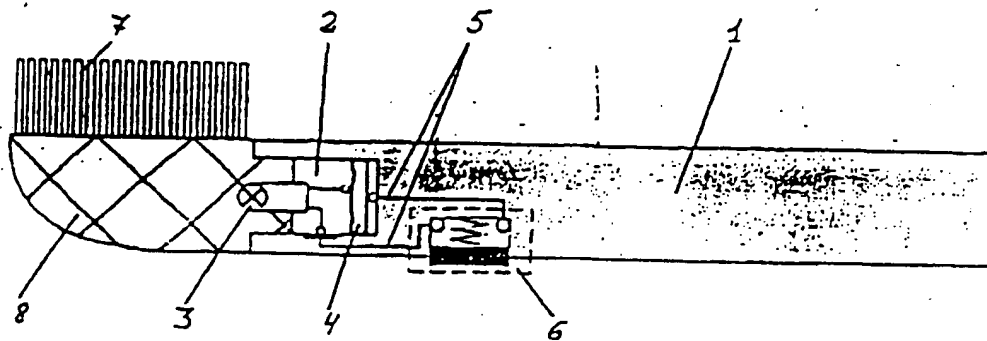


Fig .2

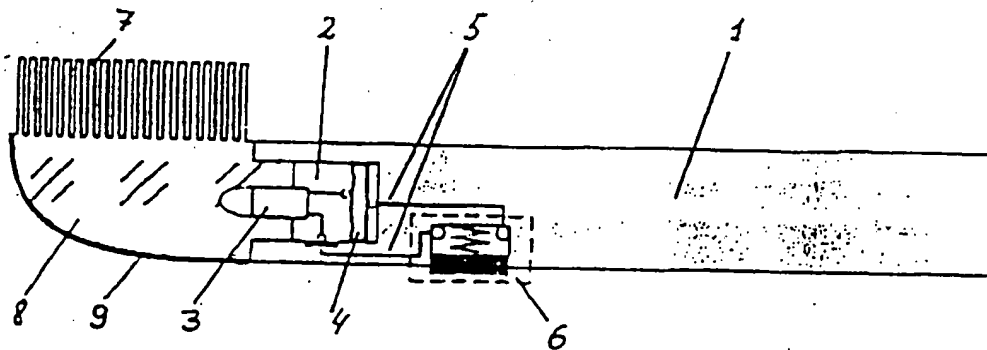


Fig .3

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